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A Report on NATO Field Trials on Sampling and Identification of Chemical Agents: A Description of Canadian Preparation, Participation and Recommendations

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ABSTRACT

Between 9-11 September 1997, NATO conducted two field trials on the sampling and identification of chemical warfare agents. These field trials were hosted by the Centre d'Etudes du Bouchet at Vert le Petit, France. The primary objective of these trials was to assess the validity of the procedures and guidance provided in NATO Allied Engineering Publication 10 (AEP-10) in light of the practical experience gained during these field trials. Ten nations participated in the field trials (CA, DA, FR, GE, IT, NL, NO, SP, UK, and US). The performance of each sampling team was assessed by umpires using criteria developed from the relevant NATO NBC standardization agreements. The NATO report published following the field trials concluded that; a) all participating nations have fully competent and effective sampling capabilities and b) the field trials had generally validated the guidance provided in AEP-10.

This report describes Canada's preparation for, participation in and recommendations from the NATO SICA field trials. Canada believes that these field trials were extremely useful not only from a scientific view, but also for raising the profile of SICA within the military. On the military side, it helped to focus our thoughts on how SICA teams might be deployed within the Canadian Forces. While the field trials helped validate the procedures in AEP-10, at the same time some problems were noted with respect to; a) the mandate of SICA and b) the use of AEP-10 Handbook as an operational document.

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Executive Summary

Title: J.R. Hancock, Capt. R. Tremblay, WO K. Ostner and LCdr. J.G. Nadeau, A Report on NATO SICA Field Trials: A Description of Canadian Preparation, Participation and Recommendations, Suffield Report No. 689, 1998, UNCLASSIFIED.

Introduction: The Canadian Forces (CF) may be called on to conduct peacekeeping or peacemaking operations in regions of the world where there is a significant threat of chemical/biological warfare agent use. To operate effectively in these theatres the CF must be able to identify the exact nature of the chemical/biological agent(s). As part of NATO, Canada may be required to collect, package, transport and analyze samples believed to contain chemical warfare agents.

Results: Between 9-11 September 1997, NATO conducted two Sampling and Identification of Chemical Agents (SICA) field trials at the Centre d'Etudes du Bouchet (CEB) at Vert le Petit, France. The object of these trials was to assess the validity of AEP-10 in light of the practical experience gained during these field trials. Ten nations participated in the field trials (CA, DA, FR, GE, IT, NL, NO, SP, UK, and US). Trial directing staff were provided by NATO, the Netherlands and France. The performance of each of the sampling team was assessed by umpires using criteria developed from the relevant NATO standardization agreements. Umpires were provided by the NATO countries, with Supreme Headquarters Allied Powers Europe providing the chief umpire.

The scope of the field trials included: sampling teams being deployed to a chemically contaminated site, conducting a site survey, collecting relevant samples, undrtaking decontamination, and packaging of samples for transport and generation of NATO standard NBC messages. Following the trial, NATO published the SICA chairman's report to LG.7, which concluded that all the participating nations have fully competent and effective SICA sampling capability. The NATO SICA report concluded that the field trials had validated the guidance provided in AEP-10, however it had also identified a number of issues that should be clarified or revised in AEP-10. This report describes Canada's preparation for, participation in and recommendations from the NATO SICA field trials.

Significance of Results: The CF may be deployed in regions of the world where there is a significant threat of chemical/biological warfare agent use. Identification of agents is of importance since the results of such analyses would contribute to the development of strategic and political positions regarding future Canadian military operations and would facilitate the dissemination of technical advice to in-theatre field commanders and medical personnel.

Future Goals: The CB threat spectrum includes chemical and biological warfare agents and toxins of biological origin in the "mid-spectrum" between these agents. The CF needs the ability to collect, transport and identify all agents in the threat spectrum. DRES will initiate an effort to integrate the disparate requirements for these agents into a single sample collection and transport system.

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INTRODUCTION

NATO may be called upon to deploy military forces in support of peacekeeping/peacemaking or battlefield operations in regions of the world where there is a significant threat of chemical/biological warfare (CBW) agent use. Under the umbrella of the NATO Army Armaments Group, Land Group 7 (LG/7) on NBC Defence established a sub-group of experts to deal with the problems associated with the Sampling and Identification of Biological/Chemical Agents (SIBCA). This sub-group produced Allied Engineering Publication 10 (AEP-10), which describes procedures and techniques for sample collection, packaging, transport and identification of samples believed to contain chemical warfare agents (1).

According to AEP-10, the prime reason for the rapid identification of chemical warfare agents in a battlefield environment is to confirm enemy use, and to support timely decisions concerning the NATO response to such use. NATO doctrine states that as an alliance, it takes the consensus of all nations before NATO responds to the use of CBW agents against NATO troops. Consensus would only be reached if all the evidence of CBW agent use clearly supported the allegation.

During the past decade, the SIBCA sub-group has conducted a number of training exercises focusing on methods for the unambiguous identification of CW agents in the laboratory. In addition, various nations have conducted national field trials to develop procedures for sample collection, packaging and transportation of CW agents. However, NATO has not previously held a military field trial to assess the various countries abilities to carry out a SICA mission.

Between 9-11 September 1997, NATO conducted two such SICA field trials at the Centre d'Etudes du Bouchet (CEB) at Vert le Petit, France. The object of these trials was to assess the validity of AEP-10 in light of the practical experience gained during these field trials. The performance of each of the sampling team was assessed by umpires using criteria developed from the relevant NATO standardization agreements (STANAGs) (2-6). Umpires were provided by the NATO countries, with SHAPE providing the chief umpire. Ten nations participated in the field trials (CA, DA, FR, GE, IT, NL, NO, SP, UK, and US) with Denmark providing umpires rather than a sampling team and France providing two sampling teams. Trial directing staff were provided by NATO, the Netherlands and France.

The scope of the field trials included: sampling teams being deployed to a chemically contaminated site, conducting a site survey, collecting relevant samples, undertaking decontamination, packaging samples for transport and generation of NATO standard NBC messages. Following the trial, NATO published the SICA chairman's report to LG/7, which concluded that all the participating nations have a fully competent and effective SICA sampling capability (7). The NATO SICA report concluded that the field trials had validated

the guidance provided in AEP-10; however, it also identified a number of issues that should be clarified or revised in AEP-10. This report describes Canada's preparation for, participation in and recommendations from the NATO SICA field trials.

PREPARATIONS FOR THE SICA FIELD TRIALS

The Canadian team which participated in the NATO SICA field trials was comprised of Mr. J.R. Hancock (Canadian representative on SIBCA), Capt. R. Tremblay (Science Officer) both from the Defence Research Establishment Suffield, Ralston, Alberta, WO K. Ostner (NBC Instructor) from the Canadian Forces NBC School, Borden, Ontario and LCdr. J.G. Nadeau (DNBCD 2-2) from National Defence Headquarters, Ottawa, Ontario.

As the field trials included all elements of a sampling mission, it was necessary for the team to be self sufficient while operating in the field. In addition, with the requirement for Canada to ship their equipment to France for the field trial, it was decided that the transport containers used for shipping would also serve for organizing the equipment used during the field trial. In total, eight transport containers were shipped to France (four containing sampling and related equipment, four containing NBC clothing). Annex I contains the inventory list for each of the sampling transport containers and NBC clothing.

In the planning stages prior to the field trials, it was decided that a SICA sampling mission could be broken down into six phases. These phases were: pre-deployment, arrival on site, sample collection, exiting the contaminated site, NBC messages and sample packaging. In the text which follows, background and operational information is provided on each phase of the mission as well as the responsibilities of each member of the sampling team. Based on their responsibilities, the team members were desiginated as: the "dirty" man (the team member responsible for the actual sample collection and the team member most likely to become chemically contaminated), the "clean" man (the team member who assists the dirty man, but should in principle not become contaminated) and the "decon" man (the team member who decontaminates the other team members, samples and equipment as they exit the contaminated site). The fourth team member, although not officially part of the sampling team, was responsible for obtaining both video and still photographs of the field trials.

In order to provide the sampling team with an aide-memoire, the responsibilities of each team member were reproduced on 11 x 20 cm laminated sheets which was carried in the leg pocket of the CF NBC suit. These checklists were used for each phase of the sampling mission and were especially useful during the pre-deployment and arrival on-site phases. In preparation for the SICA field trials, the equipment and procedures described below were tested during the months of May-August 1997 on the DRES Experimental Proving Ground. The main focus of these tests was to refine procedures and equipment to be used during the SICA field trials.

PHASE 1 PRE-DEPLOYMENT

Background Information

The pre-deployment phase involves checking that the correct sampling and NBC protective equipment is available and in operating condition prior to proceeding to the contaminated site. All members of the sampling team, in addition to being responsible for their own personal equipment, have specific responsibilities during the entire mission.

Operational Procedures

Upon being informed that sampling team is to be deployed on a sampling mission, the **clean** man:

a) completes inventory of transport container #1 containing Sampling Kit and Global Positioning System (GPS). A detailed inventory list is found in the transport container;
b) confirms operation of GPS by obtaining GPS fix on pre-deployment area;
c) issues radios to each sampling team member and performs radio check;
d) assists other sampling team members as necessary;
e) dons NBC Individual Protective Ensemble (TOPP Medium) prior to leaving pre-deployment area, and
f) completes personal equipment checklist prior to leaving pre-deployment site.

Upon being informed that sampling team is to be deployed on a sampling mission, the **dirty** man:

a) completes inventory of transport container #2 containing chemical agent monitors (CAM). A detailed inventory list is found in the transport container;
b) removes CAMs from transport container, powers up CAMs, installs inlet filters and leaves operating while at pre-deployment site;
c) checks CAM response in both modes with confidence tester. Retains one confidence tester and issues second confidence tester to clean man;
d) keeps two CAMs with him at all times. Replaces other two operating CAMs in transport container while enroute to contaminated site;
e) assists other sampling team members as necessary;
f) dons NBC Individual Protective Ensemble (TOPP Medium) prior to leaving pre-deployment area, and
g) completes personal equipment checklist prior to leaving pre-deployment site.

Upon being informed that sampling team is to be deployed on a sampling mission, the **decon** man:

a) completes inventory of transport container #3 containing decontamination kit. A detailed inventory list is found in the transport container;
b) completes inventory of transport container #4 containing packaging kit. A detailed inventory list is found in the transport container;
c) assists other sampling team members as necessary;
d) dons NBC Individual Protective Ensemble (TOPP Medium) prior to leaving pre-deployment area, and
e) completes personal equipment checklist prior to leaving pre-deployment site.

The personal equipment checklist for each sampling team members is as follows:

Clean Man

CB Overboots
CB Suit
Inner Latex Gloves
Outer CB Gloves
Respirator and Carrier
One Diazepam Autoinjector
Three HI-6 Autoinjectors
Spare Inner Latex Gloves
Spare Outer CB Gloves
Radio
Notepad and Pencil
3-Way Detector Paper
One CAM confidence tester
Reactive Skin Decontaminant Lotion (RSDL)

Dirty Man

CB Overboots
CB Suit
Inner Latex Gloves
Outer CB Gloves
Respirator and Carrier
One Diazepam Autoinjector
Three HI-6 Autoinjectors
Spare Inner Latex Gloves

Spare Outer CB Gloves
Radio
Notepad and Pencil
3-Way Detector Paper
One CAM confidence tester
Two CAMs with inlet filters
Reactive Skin Decontaminant Lotion (RSDL)

Decon Man

CB Overboots
CB Suit
Inner Latex Gloves
Outer CB Gloves
Respirator and Carrier
One Diazepam Autoinjector
Three HI-6 Autoinjectors
Spare Inner Latex Gloves
Spare Outer CB Gloves
Radio
Notepad and Pencil
3-Way Detector Paper
Reactive Skin Decontaminant Lotion (RSDL)

PHASE 2 ARRIVAL ON-SITE

Background Information

When the sampling team arrives on site they immediately check the wind direction and begin to deploy the contents of the various transport containers. If not already present, a liquid/vapour hazard area and a clean/dirty line are established. The team uses this area to assemble their decontamination equipment, obtain a GPS fix and ensure that they are in TOPP HIGH prior to entering the contaminated site. All members of the sampling team, in addition to being responsible for their own personal equipment, have responsibilities during the entire sampling mission.

Operational Procedures

Upon arriving at the sampling site, the **clean** man;

a) Conducts a visual inventory of transport containers;
    Transport container #1 - Sampling Kits and GPS
    Transport container #2 - Chemical Agent Monitors
    Transport container #3 - Decontamination Kit
    Transport container #4 - Packaging Kit
b) opens transport container #1 and obtains GPS fix;
c) assists dirty man in establishing liquid/vapour hazard area;
d) places sampling kits by decontamination boot tray;
e) sets up packaging and reporting station;
f) assists other sampling team members as required;
g) collects CAM and marker flags;
h) moves to TOPP HIGH and performs mask check, and
i) moves to clean/dirty line for final equipment check.

Upon arriving at the sampling site, the **dirty** man;

a) checks wind direction, ensuring that the sampling team is upwind of the contaminated site;
b) positions two CAMs to monitor for CW agents;
c) if not already present, establishes a liquid/vapour hazard area;
d) requests current chemical downwind message;
e) assists other sampling team members as required;
f) collects CAM and marker flags;
g) moves to TOPP HIGH and performs mask check, and
h) moves to clean/dirty line for final equipment check.

Upon arriving at the sampling site, the **decon** man;

a) unpacks transport container containing decontamination kit;
b) places boot tray approx. 5 meters on dirty side of clean/dirty line;
c) places equipment decon tray beside boot tray;
d) places decontamination tray and sponge beside second large tray;
e) places sample tray on clean side of clean/dirty line;
f) places transport container on clean dirty line;
g) prepares decontaminant by adding contents of one powder bleach container into decon Jerry can and filling with water;
h) fills boot tray with decontaminant;
i) fills decontamination tray with decontaminant;
j) prepares second batch of decontaminant by adding contents of one powder bleach container into decon Jerry can and filling with water;
k) assembles and tests sprayer;
l) assists other sampling team members as required, and
m) establishes clean/dirty line, informing other team members that from now on to cross the clean/dirty line requires them to be in TOPP HIGH.

The personal equipment checklist for each sampling team member is as follows:

Clean Man

Full IPE TOPP HIGH
Spare NBC and latex gloves
Sampling kits (Vapour and Liquid Modules)
Spare CAM battery
Detector paper
One diazepam autoinjector
Three HI-6 autoinjectors
RSDL
One CAM
Radio
5 marker flags

Dirty Man

Full IPE TOP HIGH
Spare NBC and latex gloves
Spare CAM battery
Detector paper
One diazepam autoinjector

Three HI-6 autoinjectors
RSDL
One CAM
5 marker flags

PHASE 3 SAMPLE COLLECTION

Background Information

Following a CW attack there will be physical evidence of the attack (unexploded munitions, munition fragments, craters, etc.). An initial visual survey conducted by walking the contaminated site should reveal potential sampling locations. If after an initial visual survey no contaminated sites were marked, a detailed survey using CAM is warranted.

Operational Procedures

Upon entering the contaminated site the **clean** man;

a) moves, with the dirty man, to farthest downwind location in the contaminated site. Starting on the same side of the site, approximately 10 meters apart, both team members conduct a visual survey by moving across the site in a "S" pattern which takes them upwind towards the clean/dirty line;
b) marks, with a marker flag, any potentially contaminated location. A CAM may be used to check for contamination, but in order to minimize possible contamination to the sampling team, detailed examination of a location is left until the entire site has been surveyed;
c) once the site survey is completed, the clean man leaves his CAM at the clean/dirty line. If contaminated sites were found during the survey, places a hazard warning sign, approximately 5 meters in front of the decon boot tray, facing towards clean/dirty line;
d) retrieves sampling kits and proceeds with the dirty man to the sampling location farthest downwind. The ground sheet is removed from the exterior pocket of the sampling kit and placed on the ground. The sampling kits may then be placed on the ground sheet;
e) provides the dirty man with required sampling equipment;
f) records in notebook, sampling information (e.g. site number, type of sample collected etc.);
g) holds polyethylene bag open, in order for the dirty man to place sample in bag;
h) radios the decon man with sample information, location and, if possible, provisional agent identification. Stores samples in carrying bag;
i) moves to next contaminated location upwind of current location, and

j) once all contaminated locations have been checked, moves to clean/dirty line.

Upon entering the contaminated site the **dirty** man;

a) moves, with the clean man, to farthest downwind location in contaminated site. Starting on the same side of the site, approximately 10 meters apart, both team members conduct a visual site survey by moving across the site in a "S" pattern which takes them upwind towards the clean/dirty line;
b) marks, with a marker flag, any potentially contaminated location. A CAM may be used to check for contamination, but in order to minimize possible contamination to the sampling team, detailed examination of a location is left until the entire site has been surveyed;
c) once the site survey is completed, proceeds with the clean man to the sampling location farthest downwind;
d) in conjunction with the clean man, decides on type of sample to be collected based on the on priority; 1) liquid from intact munition, 2) munition fragment and 3) environmental sample;
e) informs the clean man of what sampling equipment is required to collect the sample;
f) collects sample(s);
g) places sample(s) in polyethylene bag held by the clean man;
h) moves to next sampling location upwind of current location, and
i) once all contaminated locations have been checked, moves to clean/dirty line.

When the clean and dirty men enter the contaminated area, the **decon** man;

a) maintains radio contact with the sampling team;
b) ensures water is available at the clean/dirty line for returning team members;
c) once the team has confirmed the presence of a chemical agent, moves to TOPP HIGH, performs mask check and takes the “GAS” hazard warning sign to the edge of the contaminated site and hands it to the clean man, and
d) upon radio confirmation that sampling is complete, prepares to decontaminate returning team members.

PHASE 4 DECONTAMINATION (EXITING CONTAMINATED SITE)

Background Information

In order to minimize the danger of spreading chemical warfare agents outside of the contaminated site, it is mandatory to decontaminate the sampling team members and their equipment/samples prior to their exiting the site. The decon man is responsible for decontamination of the other sampling team members and their equipment. Decontamination is carried out in the liquid/vapour hazard area, within 10 meters of a pre-established clean/dirty line. The CF Sub-Unit Level Decontamination Apparatus (NSN 4230-21-906-0399) is used for decontamination of sampling team members. The decontaminant in use for these field trials was one kilogram of dichloroisocyanuric acid sodiumsalt dihydrate (Fichlor) dissolved in 20 liters of water.

Operational Procedures

Incoming sampling team members (clean and dirty man) proceed to the decontamination boot tray where each sampling team member in turn:

a) steps into a boot tray of decontaminant, immerses his boots in decontaminant, then steps out of tray and moves forward towards the clean/dirty line;
b) places items such as, the sampling kit or CAMs beside the equipment decon tray;
c) has his gloves sprayed with decontaminant and ensures that gloves are completely wetted by rubbing hands together;
d) removes small items such as autoinjectors and radios from pockets on IPE and places them in the equipment decon, and
e) has his hands sprayed again and is then sprayed from head to foot, front and back with bleach after which he moves towards clean/dirty line.

Sampling team member (who may be wearing either a Canadian one piece CB suit or a Norwegian two piece CB suit) is undressed by decontamination man who:

a) removes tape from around cuff of CB glove;
b) removes outer CB glove, by grasping glove at cuff and peeling glove off hand leaving inner latex glove in place. Undoes Velcro fastener at wrist and rolls up cuff (roughly one inch) and repeats for other glove;
c) undoes Velcro fastener around hood and down front of CB suit;
d) pulls down zipper from hood and front of CB suit and pulls flap from hood back over left shoulder of CB suit;
e) lifts hood over back of head;
f) for one piece CB suit, moves behind man being undressed and peels the suit from one shoulder and arm, (repeats for other shoulder) and pulls CB suit down to knee level. For a two piece CB suit, moves behind man being undressed and removes jacket one

arm at a time, and

g) for two piece CB suit, man being undressed removes suspenders and decontamination man undoes fasteners at waist of trousers. Trousers are then pulled down to knee level.

Person being undressed then steps forward and sits, facing towards contaminated site, on a bench which is placed on the clean/dirty line. The decon man:

a) undoes Velcro fasteners at ankle, rolls up trouser leg (roughly one inch) and undoes elastic fasteners on CB overboot, and
b) removes CB overboot and then slides trouser off leg. Simultaneously, the individual being undressed swings leg over to the clean side of clean/dirty line (repeat for other leg).

Undressed man stands, steps into clean area, removes gloves and CB mask. Steps a-g are repeated for each team member.

Once the sampling team members have been decontaminated and undressed, the decon man proceeds to decontaminate items such as; samples, sampling kits, CAMs, etc., in the following manner:

a) sprays gloves with bleach;
b) using sponge and decontaminant tray, wipes outside of sample bags with bleach;
c) places cleaned samples in tray on clean side of clean dirty, and
d) repeats procedure for remaining items (CAM, radios, autoinjectors) and places them on ground on clean side of clean/dirty line.

Following decontamination of personnel items, the decon man undresses himself by following the procedures described above with the exception that only the gloves need to be sprayed with decontaminant.

PHASE 5 NBC MESSAGES

Background Information

Following a chemical warfare agent attack, NBC Messages are sent within the CF command structure to report an attack to higher commands and to warn local units in the field. The structure and content of these messages are outlined in NATO ATP-45 (STANAG 2103) (8). Upon observing an attack, a NBC-1 message is sent to the NBC sub-collection center. SICA sampling teams may then be deployed as a result of these NBC messages. Once the SICA sampling team has conducted their survey and sampling of a suspected contaminated site, they, in turn, generate an NBC-4 message which is sent to the NBC sub-collection center.

Operational Procedures

The clean man is responsible for generating and transmitting NBC-4 messages during the sampling mission. This message contains three parts, "Hotel (H)", "Quebec (Q)" and "Sierra (S)". The **clean** man:

a) completes line "Hotel" on the NBC-4 message form indicating the type of agent;
b) completes line "Quebec" indicating location of sampling and type of sample collected. In addition this line is used to indicate a SICA sample was taken;
c) completes line "Sierra" indicating date-time group (Zulu) when samples were collected;
d) repeats lines "Hotel", "Quebec" and "Sierra" as often as necessary, and
e) transmits NBC-4 message to NBC Sub Collection Centre.

PHASE 6 SAMPLE PACKAGING

Background Information

Once samples have been collected in the field it is important to transport them to a field or national laboratory as quickly as possible. It is the responsibility of these laboratories to provide rapid unambiguous identification of the chemical agents. The most rapid, means of transport is by air. Chemical warfare agents, due to their toxicity, are classified by the International Air Transport Association (IATA) as dangerous goods (Class 6 Division 6.1) on both commercial and military aircraft (9,10). In Canada, the transportation of dangerous goods on CF aircraft is governed by regulations found in CF publication A-LM-117-001/FP-001 (9). In addition NATO STANAG 3854 provides guidelines for the transportation of dangerous goods not allowed on commercial aircraft (10). The packaging system described below meets the requirements for Class 6 Division 6.1.

Operational Procedures

The packaging and labelling of the samples is the responsibility of the clean and dirty man. After going through the decontamination procedure they don new respirators and gloves and retrieve the samples (following their decontamination) from the clean side of the clean/dirty line. The men then:

a) remove one dangerous goods packaging box from the transport container. This unit contains all the packaging and labels for proper packaging of the samples. It consists of an outer packaging (the box), an inner packaging (plastic container) and associated packaging materials;
b) remove the foam lid, and the inner plastic container retaining the foam lid;
c) in order to minimize movement each small samples may be wrapped in bubble pack. The inner packaging has an insert which divides the inside into four compartments. This container may carry up to four individual samples (one in each of the four compartments). Large samples such as munition fragments can be packed into this container by removing the dividing insert, wrapping the sample in bubble pack and placing the sample in the container;
d) close the lid of the inner packaging, ensuring that there is a rubber o-ring on the outside of the container;
e) secure the inner packaging with security tape around the outside of the lid, ensuring that the tape goes completely around the outside of the lid and overlaps the lid and body of the inner packaging;
f) remove the labels from the outer packaging;
g) insert the inner packaging into the cardboard ring in the outer packaging;
h) tie the top of the plastic bag together with the tie provided;
i) place foam lid on top of inner packaging;
j) affix toxic hazard label (in diamond orientation) on side of the outer packaging. DO NOT COVER any existing markings on outer packaging with hazard label;
k) affix "UN 2810 Toxic liquid, organic" and "UN 3243 Solids containing toxic liquid" label to outside of the outer packaging beside the toxic hazard label;
l) affix address label to outside of outer packaging (DO NOT COVER any existing markings on the outer packaging);
m) complete the Sample Data Sheet and place the top copy inside outer packaging. Close the lid of the outer packaging and secure lid with packaging tape. Retain second copy of Sample Data Sheet, and
n) transfer package to shipper for forwarding to laboratory for analysis.

SHIPMENT OF TRANSPORT CONTAINERS TO FRANCE

At the beginning of August 1997, the transport containers were handed over to the DRES Material Control Group for shipment to CEB. Due to the transport requirements, it was decided to employ a commercial courier company. Federal Express was selected as they were able to transport the shipment from DRES directly to CEB. The shipment contained two dangerous goods; dichloromethane (toxic and infectious substances) used in the sampling kits and lithium batteries (miscellaneous dangerous goods) which are used in the CAM. Both items were packaged in accordance with the transportation of dangerous goods regulations. In addition the shipment also contained four CAMs which employ a radioactive ^{63}Ni source. These items, which did not constitute dangerous goods were identified on the Federal Express Way bill as "UN2910 Radioactive material, excepted package, instruments".

The Material Control Group at DRES initiated the shipping process on 1 August 1997 with Federal Express pick-up of the shipment occurring a few days later. Despite prior assurances from Federal Express that no further paperwork was required, once the transport containers reached their Calgary office, additional paperwork was requested. This request focused on the shipment of radioactive materials, with Federal Express now requiring a statement from the French government, that they would be allowed to deliver the shipment from the point of entry (Charles de Gaulle airport) to CEB. Although this information did not appear to be required under the transportation of dangerous goods regulations, DRES contacted the French National competent authority (as listed in the 1997 IATA Dangerous Goods Regulations) in an attempt to provide Federal Express with the requested information. Over a period of two weeks DRES was unable to have the information forwarded to Federal Express. At this point, CEB was contacted and asked if they could provide the information. CEB provided the information to Federal Express and on 27 August 1997, the shipment officially entered the Federal Express system.

When the Canadian team left for France on September 5th, 1997 the status of the shipment was still unclear. Although the shipment arrived at CEB in time for the field trials, in future, it appears that on out-going shipments rather than depending on the ability of the courier company to provide custom clearance (brokerage services), DRES should utilize the services of a freight forwarder at the destination. This company would serve as an agent of DRES and generate the proper customs clearance documentation as well as serving as point of contact on both the out-going and return shipments.

FIELD TRIAL PARTICIPATION

On September 9th and 11th, 1997, two NATO SICA field trials were held at CEB, Vert le Petit, France. These trials, hosted by France were coordinated by staff from CEB and military personnel from the Section Technique de l'Armee de Terre (S.T.A.T.). The participants from 10 NATO countries and NATO are listed in Annex II. The objectives of these trials were to: a) assess the validity of AEP-10 in light of the practical experience gained during these field trials and b) assess the various countries abilities to carry out a SICA mission. The performance of each of the sampling was assessed by umpires using criteria developed from the relevant NATO STANAGs (2-6). Annex III lists the criteria used by the umpires during the field trials.

FIELD TRIAL #1

On the morning of September 9th, 1997, the SICA teams from the participating NATO countries assembled at CEB and were given an operational briefing which described the current situation:

- Following a period of tension between the states of NATO and a hostile nation equipped with chemical weapons, NATO forces are positioned tactically, prepared

for intervention if requested by the United Nations.

- The hostile nation reacts to NATO deployment with a chemical strike on a rear command post. Detectors indicated the use of a persistent chemical nerve agent.
- The contaminated area has been marked and isolated.
- The Commander of the NATO CJTF has ordered a NATO SICA team to the area to take samples in the contaminated area and to transport them to the nearest NATO laboratory for analysis.

Figure 1 illustrates the trial layout used for both field trials. The outer perimeter was marked with surveyors tape, with a single entry point for all SICA teams on the upwind side of the layout (hot line). Observers were kept behind this point, with only sampling teams, umpires and trial directing staff (all in full IPE) allowed on the trial layout. Once on the layout, a further line was used to demarcate, the contaminated and clean areas. This line had individual entry points for each SICA team, who were assigned a section of the trial layout. Due to restrictions in the total space available for the trial and the large number of SICA teams, each team was assigned an area of approximately 120 square meters. While this limited area resulted in a compression of the distances on the layout (e.g. the distance from the sampling site to the clean/dirty line), it did not compromise the results from the field trial. Within each teams' assigned area there was a "crater" from which samples could be collected.

Prior to proceeding to the trial layout, umpires were assigned to each team (NL and SP umpires were assigned to CA team), and using the checklist shown in Annex III, they inspected the equipment used by each SICA team. At this point, the teams were instructed to proceed to the dressing tent which was located approximately 300 meters from the trial layout and don their individual protective equipment. With these instructions, the Canadian team proceeded to carry out the tasks as described previousl for the pre-deployment phase of the sampling mission.

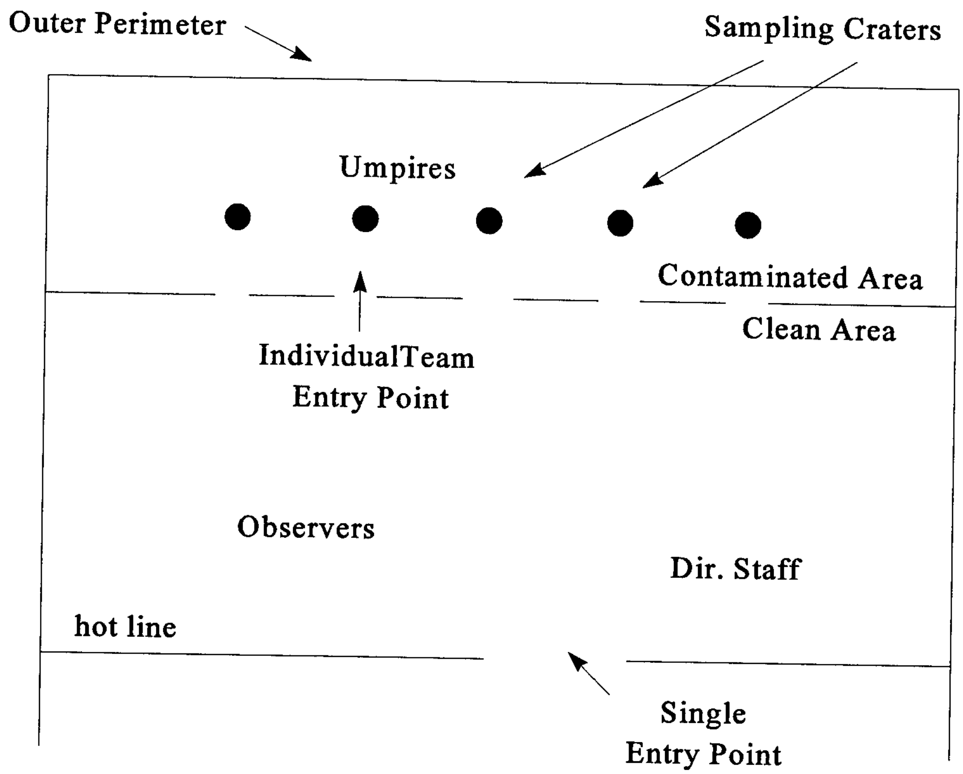

Figure 1. Schematic of trial layout used on both SICA field trials

Once dressed in IPE (TOPP MEDIUM), the Canadian team moved to the trial layout and was joined there by the team's umpires. France delivered the transport containers to the trial layout as well as Jerry cans of water for preparing decontaminant. Once the transport containers were in place outside the hot line, the pre-deployment checklist was completed. Clarification on two points was sought from the umpires. The first point dealt with the location of the end of the contaminated site. It was agreed that the site up to the individual team entry point was not contaminated. It was important to clearly define the contaminated site as this influenced where the clean/dirty line and decontamination equipment were placed as well as indicating the point at which it was mandatory to be in protective posture TOPP HIGH. The second point dealt with the whether or not the site had been surveyed and marked. It was agreed that the site had been surveyed and marked, which meant that a site survey by the sampling team was not required. Figure 2 illustrates the Canadian team at the

trial site in TOPP MEDIUM, going though the pre-deployment checklist and discussing with the umpires the location of the contaminated area.

Figure 2. Canadian Team a) performing pre-deployment checklist and b) clarifying location of contaminated site with umpires.

The sampling team then proceeded to move the transport containers into the trial layout, through the entry point, and each team member initiated the procedures outlined in the arrival on site checklist. When these procedures were completed, the clean and dirty man were in TOPP HIGH and were ready to enter the contaminated site. Figure 3 illustrates the layout of the decontamination equipment in the liquid/vapour hazard area and the clean/dirty line. As the final step in this phase of the mission, the decon man then established the clean/dirty line.

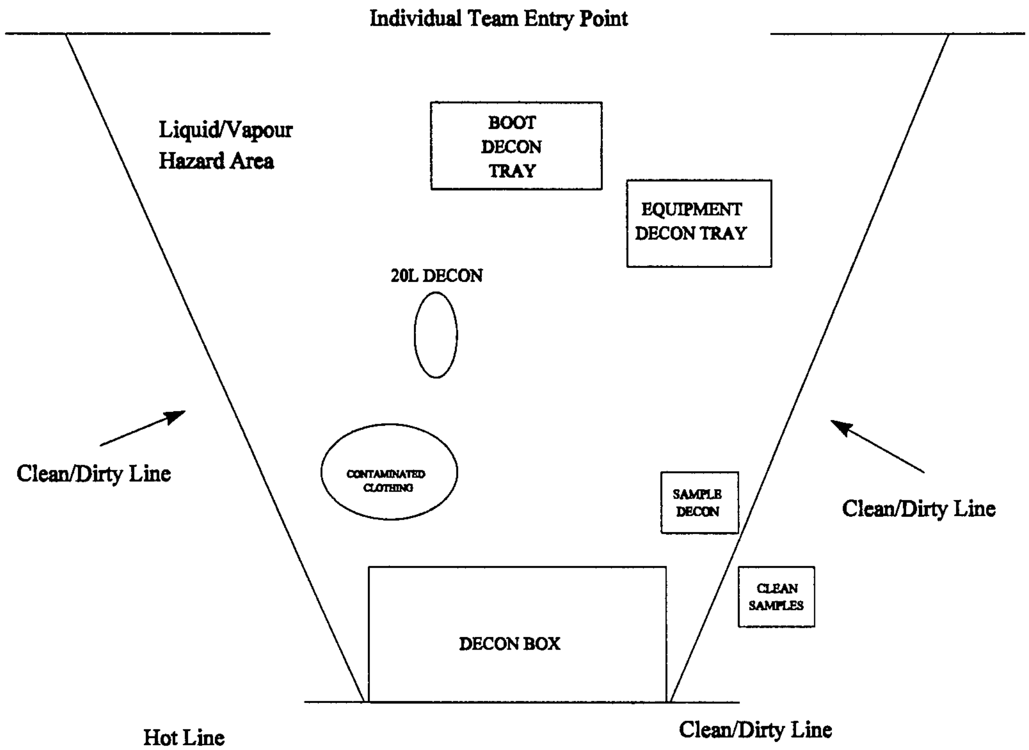

Figure 3. Schematic (not to scale) of Liquid/Vapour Hazard Area showing the location of the decontamination equipment, clean/dirty line and the entry point into the contaminated site.

The clean man and the dirty man then entered the contaminated site and using one CAM in G mode and one in H mode proceeded, from the upwind side, towards the "crater". As the site had already been surveyed and marked no site survey was conducted. The dirty man carried the G mode CAM and once at the crater started to check for the presence of G agent vapour. The clean man remained upwind of the crater. A 3 bar G agent response was almost immediately obtained while monitoring the air above the items in the crater. Visual inspection of the crater revealed that it contained a variety of materials including: metal, glass and polymer fragments, free standing liquid (likely water), vegetation and possibly contaminated soil. Once there was positive indication of CW agents, the sampling team radioed the decon man to prepare the NATO standard warning sign indicating that the site

contained CW agents. This sign was then placed just inside the contaminated site.

Vapour samples were collected from two different areas within the crater that gave positive CAM responses. Control vapour samples were collected upwind of the crater. A liquid sample was collected from the container in the crater. No indication of CW agents was obtained from the liquid with 3-way detector paper. The liquid did not wet the detector paper, indicating that it was aqueous rather than organic. A soil sample was collected from the wet soil in the crater as well as a control soil sample from an area outside the crater which did not give a positive CAM response. A swab sample was taken from a pool of liquid on vegetation in the crater. Finally samples of the glass, metal and polymer fragments were collected as a single sample.

Following sample collection, the decon man was contacted by radio and informed that sampling was completed and the team was heading to the decon station. Team members and equipment were decontaminated as described above in Phase 4 of the sampling mission. Canada, by prior agreement also carried individual and equipment decontamination for the three member Norwegian team.

Once out of the contaminated site, the clean and dirty man proceeded to package and label the samples in accordance with the instructions described above in Phase 5 of the sampling mission. In order to complete the sampling mission, NBC-4 message forms, as described in ATP-45, were filled out and shown to the umpires. At this point, it was agreed that the exercise was completed and the team was free to recover and repack their equipment.

FIELD TRIAL #2

On the morning of September 11th, 1997, the SICA teams from the participating NATO countries again assembled at CEB and were given an operational briefing. The main difference from the previous briefing was that for this trial, the site had not been surveyed. Following the umpires recommendations from the field trial #1 (see the detailed umpires debriefings in the following section), Canada increased the size of it's team to four members by including the video camera operator. This team member (known as the "recorder") was responsible for video recording the sampling phase of the mission, radio communications with the decon man and physically recording the sample numbers, sample types and location of all samples collected.

The trial layout was the same as used for field trial #1 and is illustrated in Figure 1. Prior to proceeding to the trial layout, umpires were assigned to each team (US and FR umpires were assigned to the CA team). At this point the teams were instructed to proceed to the dressing tent and don their individual protective equipment. With these instructions, the Canadian proceeded to carry out the tasks as described in the Phase 1 pre-deployment checklist.

Once dressed in IPE (TOPP MEDIUM), the Canadian team moved to the trial layout and was joined by the team's umpires. France delivered the transport containers to the trial layout as well as Jerry cans of water for preparing decontaminant. Once the transport containers were in place outside the hot line, the pre-deployment checklist was completed. Clarification was sought from the umpires on the location of the end of the contaminated zone. It was agreed that the site up to the individual team entry point was not contaminated.

The sampling team then proceeded to move the transport containers into the trial layout and each team member initiated the procedures described in the Phase 2 arrival on-site checklist. When these procedures were completed, the clean man, dirty man and recorder

were in TOPP HIGH and were ready to enter the contaminated site. The decon man then established the clean/dirty line.

The recorder remained outside the contaminated site, while the clean man and dirty man conducted a site survey as described above in Phase 3 of the sampling checklist. The first contaminated site (Site 1) was found behind the crater and gave a positive G agent response with the CAM. The site was marked and the remainder of the contaminated site was surveyed. In the remainder of the site only the crater (Site 2) was identified as another sampling location. The contents of the crater were the same as those found during field trial # 1. At this point the recorder crossed into the contaminated site and started video recording. During the site survey of the crater it was observed that the G mode CAM was not clearing down. The inlet cap was placed on the CAM and the CAM was left for approximately 5 minutes to see if the instrument would clear down properly. Once it was determined that the CAM would not respond properly, the decon man was contacted by radio and a spare CAM was brought forward to the edge of the contaminated site. The faulty CAM was placed in the liquid/vapour hazard area and the replacement CAM was used for further monitoring. Once there was positive indication of CW agents, the sampling team radioed the decon man to prepare the NATO standard warning sign indicating that the site contained CW agents. This sign was then placed just inside the contaminated site. As a result of the debriefing from field trial #1, control vapour and soil samples were collected at this point, prior to sampling any of the contaminated sites.

Again, as a result of the debriefing following field trial #1, the Canadian team added to their sampling kit four spikes (normally used to fasten surveyors tape) and used these to fasten the ground sheet to the ground. In addition, during field trial #2, duplicate samples were collected for each sample type. Vapour and soil samples were collected from Site 1. CAM response for these samples, was positive in G mode, but a negative response was obtained for 3-way detector paper pressed onto the soil. Vapour samples were collected from contaminated areas within the crater (Site 2). A liquid sample was collected from the

container in the crater. No indication of CW agents was obtained with the liquid with 3 way detector paper. The liquid did not wet the detector paper, indicating that it was aqueous rather than organic. Swab samples were taken from a pool of liquid on vegetation in the crater. This area produced a G agent response on the CAM and gave, after 5 minutes, a faint yellow colour on 3-way detector paper. Samples of vegetation were collected as well as samples of the glass, metal and polymer fragments from within the crater. During sampling from the crater, the outer glove of the dirty man became visibly contaminated with liquid from the crater. The clean man indicated to the umpires that in an operational situation, it was standard procedure for the contaminated glove to be removed and replaced with a clean glove (spare gloves are carried by each team member). It was indicated by the umpires that they understood the procedure and in the interest of time it was adequate to simulate this procedure and proceed with the mission.

Following sample collection, the decon man was contacted by radio and was informed that sampling was completed and the team was heading to the decon station. Following consultation with the umpires, it was agreed that for demonstration purposes a single team member would be decontaminated as described above in Phase 4 of the sampling mission. Canada, by prior agreement, also decontaminated a single member of the Norwegian team.

Once out of the contaminated site, the clean and dirty man proceeded to package and label the samples in accordance with the instructions described above in Phase 5 of the sampling mission. In order to complete the sampling mission, NBC-4 message forms, as described in ATP-45, were filled out and shown to the umpires. At this point it was agreed that the exercise was completed and the team was free to recover and repack their equipment.

UMPIRES DEBRIEFINGS

FIELD TRIAL #1 DEBRIEFING

On the day following field trial #1, the chief umpire, Lt. Col. Semancik of SHAPE, gave a general debriefing to all teams. He indicated that the following conclusions had come from a discussion with all the umpires that had been on the field trial layout the previous day. The main conclusions from field trial #1 were as follows (comments in **bold** are the authors):

- Generally the teams were well trained and professional;
- Two person sampling teams were too small. This was identified as a fault of AEP-10 which describes such sampling teams. Correction to AEP-10 will be necessary. It was felt that a 4-6 man team was desirable. **Canada added a fourth team member for field trial #2 by including the video camera operator and assigning additional duties to this team member;**
- The number of samples to be taken was not specified in AEP-10. It was proposed that 2 to 3 samples be taken for each sample type. **This deals with the number of replicate samples that should be taken and should be discussed within the SIBCA group. Normally, replicates are used to assess the reproducibility of a process. The collection of replicate samples would illustrate the reproducibility of sample collection. It is possible the additional samples could be sent to other laboratories for confirmatory analysis. In Canada's opinion it would then be preferable to send a single sample to a co-ordinating laboratory and have them subdivide the sample as required;**
- There is a need to standardize forms and documentation for continuity of evidence. **As long as the issue of legal collection of evidence doesn't become the main focus of SIBCA, there are valid reasons for standardizing documentation;**
- Packaging procedures for control and actual samples need consideration in AEP-10. **There was general agreement that samples and controls, where possible, should**

be packaged in separate containers;

- Some teams collected air samples upwind of the contaminated site;
- There were problems with contamination control;
- Procedure for entering the contaminated area. **What protective posture should troops adopt when entering a contaminated site? This point was of concern to Canada prior to the field trials and the reason Canada sought clarification from the umpires on where the contaminated site was located prior to the entering the trial layout;**
- Checking of control samples for contamination;
- Too much chatter on the trial site. **In some cases teams were discussing what their procedures should be during the sampling phase of the mission;**
- Diversity of sampling equipment. **Given the diversity of sampling equipment, it is unlikely that a standard NATO kit will bw adopted;**
- Descriptions of military and specialist teams confusing in AEP-10;
- Avoid time consuming procedures and
- Difficulty in the air transport of SICA kit. **Some countries, Canada included, had difficulty having their sampling equipment shipped by air to France. This was mainly a problem of international customs regulations and did point out the problems that may be encountered, even with relatively routine shipments.**

Following the general debriefing, each team met separately with their umpires for an individual team debriefing. The umpires who evaluated the Canadian team (NL and SP) started the debriefing by making some general comments. They believed the Canadian team had demonstrated that they were well trained and very familiar with their procedures. They felt that there was good discussion between the team members and that this led to each team member checking themselves and each other. The umpires felt that the use of checklists was a good idea as it identified each team members responsibilities. They commented that they were impressed not only with the decon procedures used by Canada, but also that the decon man at all times kept a watchful eye on the sampling team members while they were in the

contaminated site. They felt that the Canadian equipment was well designed and easy to handle. Finally they indicated that they liked the Canadian teams system of using two gloves along with carrying spare gloves in the respirator carrier. Two general comments the umpires made that the Canadian team thought were extremely relevant dealt with control samples and the use of a ground sheet for the sampling kits. The umpires suggested that control samples should be collected as soon as possible during the sampling phase of the mission in order to minimize the chances of contamination of the samples. The use of a ground sheet under the sampling kits by Canada was well received by the umpires. They suggested that in cases of high winds, it would be useful to include a means of fastening the ground sheet to the ground.

The umpires then went through the checklist found in ANNEX III and indicated where they felt the Canadian team was in compliance with AEP-10. Where the umpires felt the Canadian team was not in compliance with AEP-10, they sought clarification of the issue with the team members. Comments in **bold** are those of the authors.

Using the Protection/Contamination control checklist the umpires indicated that the Canadian team was in compliance with all items on the checklist. Under item 2.2, they indicated that they approved of the Canadian full person decontamination and undressing drills, but thought that in cases where time was critical that it would be possible to carry out only hands and feet decontamination. **Canada agreed that, if time was critical, then a minimal hands and feet decontamination was warranted. In general, for safety of the team and contamination control, Canada felt that it was best to carry out a full decontamination and undressing procedure.**

Using the Sampling checklist for a unit military team, the umpires indicated that, with the exception of eight items, the Canadian team was in compliance with all remaining 57 items on the checklist. Five of these eight items (2.12, 3.12, 4.14, 5.12 and 6.12) dealt with means for storing samples (air, water, soil and material) in order to avoid decomposition

during transport. In AEP-10, it is indicated that cooling the samples during transport may minimize decomposition of chemical warfare agents. **The Canadian equipment does not provide for the cooling of samples during transport. Canada feels that the requirement for refrigeration is overstated in AEP-10 and believes the SIBCA subgroup should evaluate the scientific requirement for cooling samples. If the evaluation does not support this requirement, then it should be removed from AEP-10 and its implementation left to the discretion of individual nations.**

Item 1.3 of the Sampling checklist determines whether the team has the equipment, such as a videocamera or still camera, available for recording of factual information. **AEP-10 suggests that sampling teams carry portable equipment for recording of factual information during sample collection. It gives examples of this equipment such as Polaroid photocameras, cassette tape recorders, video cameras, still cameras and maps. In the case where maps are not available, it suggests that the sampling team could draw sketches of the sampling site, indicating where samples were collected. While the Canadian team did not include video or still cameras as part of their equipment, they did have the ability to sketch maps and indicate sampling locations. Perhaps the important question is "To what use can the sampling team or laboratory analyst put this information?" It would appear photographs could be used as part of the documentation for the collection of legal evidence. In this case it would be necessary to obtain further information on the rules of evidence for video and still photographs.**

Item 4.2 checks that amount of water sample taken is in the order of 50-100mL. The Canadian sample bottle can hold up to 20 mL of a water sample. Item 5.1 checks that the amount of soil taken is approximately 200 mL. The Canadian sample bottle can hold up to 20 mL of a soil sample. **Canada believes that the requirement for sample containers with a volume of 200 mL as described in AEP-10, should be reviewed by the SIBCA subgroup. While Canada feels that 20 mL of soil or water is sufficient for analysis purposes, it recognizes that other NATO countries may have other requirements. For**

instance, in place of replicate samples, it may be desirable to collect larger samples for subsequent sub-division at the laboratory.

Using the Reporting checklist the umpires indicated that the Canadian team was in compliance with all items on the checklist.

FIELD TRIAL #2 DEBRIEFING

As field trial #2 was held on the last day of the visit to CEB, there was a team debriefing by the two umpires immediately following the completion of activities on the trial layout. The umpires commented on the thoroughness of the decontamination procedure used by the Canadian team, but indicated that, in cases where time was critical, that it would be possible to carry out only hands and feet decontamination.

The umpires then went through the checklist found in ANNEX III and indicated where they felt the Canadian team was in compliance with AEP-10. Using the Protection/Contamination control checklist, the umpires indicated that the Canadian team was in compliance with all items on this checklist. Using the Sampling checklist for a unit military team, the umpires stated that the kit did not provide a means for storing samples (air, water, soil and material) in order to avoid decomposition during transport. In AEP-10 it is indicated that cooling the samples during transport may minimize decomposition of chemical warfare agents. **The Canadian equipment does not provide for the cooling of samples during transport. Canada feels that the requirement for refrigeration is overstated in AEP-10 and believes the SIBCA subgroup should evaluate the scientific requirement for cooling samples.**

The umpires indicated that, although the Canadian samples were bagged and decontaminated, a second bag should be used at the decon line. **Section 2.7 of AEP-10**

discusses "General Packaging and Preservation of Samples". The requirements for double bagging and decontamination serve to protect the sampling team and laboratory analysts. Canada believes that this section needs clarification as it is unclear how many layers of protection are required. Canada suggests a two layer system using a primary and secondary container. The sample would be placed in the primary container (e.g. vial, bottle, bag), which is then placed in a clean secondary container. National procedures may require decontamination of the primary and/or secondary container prior to packaging for transport.

Using the Reporting checklist the umpires indicated that the Canadian team was in compliance with all items on this checklist.

The umpires had three other specific observations of the field trial. The first dealt with the collection of samples from Site 1 (the area just behind the crater). In their opinion despite the fact that contamination was found outside the crater, the crater itself was the most important sampling location. They felt that it was unnecessary to collect samples from Site 1 and the focus should have being solely on the crater (Site 2). **Due to the compressed distances on the trial layout, Canada considered Site 1 to be a separate sampling location from the crater (Site 2). This was indicated during the site survey phase by marking both sites with separate marker flags and the collection of samples from both sites was warranted.**

The last two observations dealt with contamination control. When the faulty CAM was replaced in the field, the clean man placed it in the liquid/vapour hazard area and the umpires felt that there should be no movement from the contaminated site into the liquid/vapour hazard area during the mission. **Prior to the first entry into the contaminated site (through the liquid/vapour hazard area) the decon man establishes the clean/dirty line and informs the team that to cross the line they must be in TOPP HIGH and that when crossing the clean/dirty line all team members and their**

equipment are considered contaminated. Canada then allows team members to move within these areas. Normally the only time Canadian team members would move through the liquid/vapour hazard area is once the sampling mission is completed and they are proceeding to be decontaminated.

Finally, there was some discussion on the decision to replace the dirty man's contaminated glove with a clean glove during the sampling phase. The umpires felt that this was unnecessary and that exposure of the dirty man to the environment would have been unwarranted. **On this issue, Canada disagrees with the position taken by the umpires. The replacement of a chemically contaminated glove is justified on both safety and contamination control grounds. In order to minimize the risk to the team member the glove should, as time permits, be replaced with a clean glove. This procedure will also minimize the spread of contamination within the contaminated site and between samples. All Canadian team members carry spare gloves in their respirator carrier for this purpose. The risk to the team member from the environment is minimal as the team member wears a latex glove under the NBC glove. Even in the case of a short exposure of unprotected skin to the environment, there is negligible danger from the vapour absorption through skin from chemical warfare agents.**

CANADIAN RECOMMENDATIONS

Canada believes that these field trials were extremely useful not only from a scientific viewpoint, but also for raising the profile of SICA within the military. Scientifically these field trials helped validate what had been written in AEP-10 while pointing out some problem areas. On the military side, the trials ways in which SICA teams might be deployed within the Canadian Forces. Two major issues were identified by Canada as a result of these field trials; a) the mandate of SIBCA and b) the use of AEP-10 Handbook as an operational document.

In Chapter 1 of Edition 4 of AEP-10, it states that "the prime reason for the rapid identification of chemical warfare agents in a battlefield environment is to confirm enemy use and to support timely decisions concerning the NATO response to such actions." The document also states that the proof of use must be such that it cannot be refuted. In recent years, the SIBCA subgroup has interpreted this to mean that there must be established a chain-of-custody showing that the whereabouts of the sample is known at all times. More recently, this concept of "proof" has expanded to include the premise that sample collection and subsequent analysis must be such that they would stand up in an international or world court.

The first issue that the SIBCA subgroup must consider is whether or not the collection of legally defensible evidence is within the mandate of SIBCA. In these deliberations, it may be necessary to consult with various military, legal and political representatives within NATO and national governments. If it is decided that SIBCA teams should collect and analyze this type of sample, numerous questions will have to be answered. The need to collect legally defensible evidence will have a dramatic impact not only on how samples are collected, but also on who will be responsible for sample collection and analysis. For example, this may mean that a military sampling team will not be used, but rather a highly trained team in the collection of legal evidence.

During these field trials, the umpires used a checklist developed from NATO STANAG 4359 (AEP-10) as well as a number of other NBC related STANAGs. These checklists provided a common criteria against which the umpires could evaluate the performance of the sampling teams. Now that the exercise has been completed, it is time to reflect on the use of AEP-10, not in this exercise but as a general Handbook. It has always been Canada's view that AEP-10 was written as a general guide for operators in the laboratory and the field. In this context, a variety of national interests were reflected in the Handbook without the necessity of selecting specific procedures or techniques for use within NATO. Perhaps it is now time to examine how each country uses AEP-10. One approach would be to have AEP-10 and the affiliated STANAG (4359) state the basic NATO standards for SICA operations. In thi case, a country might choose to use the STANAG itself as the implementation document or write their own document based on the basic requirements in STANAG 4359.

REFERENCES

1. Allied Engineering Publication 10, NATO Handbook for Sampling and Identification of Chemical Warfare Agents, Edition 4, 1995.

2. NATO Standardization Agreement No. 2002, Warning signs for the marking of contaminated or dangerous land areas, complete equipment, supplies and stores, Edition No.7, 26 November 1980.

3. NATO Standardization Agreement No. 2150, NATO Standards of Proficiency for NBC Defence, Edition 3, 2 May 1985.

4. NATO Standardization Agreement No. 2352, Nuclear Biological and Chemical (NBC) Defence Equipment - Operational Guidelines, Edition 3, 16 December 1988.

5. NATO Standardization Agreement No. 2429, Personnel Identification While in NBC Individual Protective Equipment (IPE), Edition 1, 12 August 1993.

6. NATO Standardization Agreement No.4359, NATO Handbook for the Sampling and Identification of Chemical Warfare Agents, Edition 1, 29 January 1991, Amended 28 February 1996.

7. NATO Defence Support Division, DS/A/LAND(97)463, Chairman's Report to LG/7, 18 September 1997.

8. NATO Standardization Agreement No. 2103, Reporting Nuclear Detonations, Biological and Chemical Attacks, and Predicting and Warning of Associated Hazards and Hazard Areas, Edition 6, February 1982.

9. Transportation of Dangerous Goods by Canadian Forces Aircraft, A-LM-117-001/FP-001, Chief of Defence Staff, Canada, 1 December 1996.

10. NATO Standardization Agreement No.3854, Policies and Procedures Governing the Transportation of Dangerous Cargo, Edition 2, 15 February 1988.

ANNEX I

CONTENTS OF TRANSPORT CONTAINERS

Transport Container #1 (Sampling Kits and GPS)

Chemical Agent Sampling Kit Vapour and Solid Sampling Module
- One Drager hand pump
- Six Tenax filled air sampling tubes
- Six TDS3 air sampling tube transport containers
- Twelve metal scoopulas
- Five 20 mL glass sample vials
- Six sheets aluminum foil
- Two large polyethylene bags
- Four medium polyethylene bags
- Four small polyethylene bags
- One package cotton tipped swabs
- One 20 mL vial of dichloromethane
- One pair of tongs
- One notebook
- Two markers
- One ball-point pen
- Two lead pencils
- Twenty adhesive labels

Chemical Agent Sampling Kit Liquid Module.
- Two pipette pumps
- Six 10 mL disposable pipettes
- Four 5 mL disposable syringes
- One 50 mL disposable syringe
- Four syringe adapters
- Six 20 mL glass sample vials
- Two packages of chemical agent detector paper
- Four sections of 1/8" narrow bore teflon tubing
- Three feet ¼" tygon tubing
- One pair of scissors
- One pair of gloves
- Four pair of plastic tweezers

Four bundles of 5 each yellow maker flags
One roll of surveyors tape
Six metal pikes
One pair of scissors
One Global Positioning System (GPS) and manual
One package of AA batteries for GPS

One compass
Two lead pencils
One package of hazard symbols
Hazard symbols posts
Four radios

Transport Container #2 (Chemical Agent Monitors)

Four Chemical Agent Monitors
Four Confidence Testers
Four CAM Carrying Cases
Two Spare Nozzle Caps
One Box of CAM Batteries

Transport Container #3 (Decontamination Kit)

20 liter Jerry Can
2 metal trays (approx. 24"x13"x4")
2 metal trays (approx. 8"x8"x3.5")
Pump assembly
Adapter assembly
Extension wand
Solid Black spray hose
Spray nozzle
Spare Parts kit
Tool kit
Sponges
4 x 1 kg powder bleach bottles

Transport Container #4 (Packaging Kit)

Four Class 6 Division 6.1 PG I IATA approved containers.
One roll of security tape
One roll of fiberglass tape
One roll of gun tape
One clipboard
One pad of sample data sheets
Two lead pencils
Two respirators
Two pair of scissors

One bag of latex gloves
ATP-45 booklet
ATP-45 message forms
One notebook

MILITARY CLOTHING

Eight CF NBC Suits
Four Canadian C4 NBC Respirators and Carriers
Four spare C2 Respirator Canisters
Four Canteens with drinking attachment
One dozen latex gloves
Fourteen pairs NBC gloves
Four pairs NBC Overboots
Two pairs of Combat Boots
One Field Hat
Three pair Combat Pants
Three Combat Shirts

ANNEX II
SICA EXERCISE - September 1997
List of participants

FRANCE

Gal AUSSEDAT
Gal FUMADO
Lt. Col. du Tremolet
Col. HASSELMANN
DERRIEN Loic
POULLELAOUEN Guy
ROMON Pascal
ERNDT Vincent
DOXIN Claude
LAMOUR
BADIER
TRAVAILLOT
ACHA
DOLEGEAL
MAGE
VERSAILLES
BARANGER
SOTER
STANEK
COGEZ
LAFARGUE
MAVELLE
AUFFRET
ESNAULT
PIROT
SILLON Daniel
LECOCQ Joel
LIGONNIERE Jacques

SPAIN
ALVAREZ Juan Domingo
FORES Carlos Forcano
LOPEZ Pedro Luis Sanchez
ALBERTO Gonzales TOLEDO
MURO RODRIGUEZ Ismael
MARTINEZ Vasquez

THE NETHERLANDS

FRANKORT Philipp
BLOKZYL Berend
OLIVIER Reinerus
DE REUVER
NEUWENHUIZEN
KLAASSE
LOOSSCHILDER
WIJNMAALEN

NORWAY
BALLANGRUD Per
TORNES John
FULLU Lars

UNITED KINGDOM

WOOD
Sac REDFERN
Sac COCKROFT
Sac BROWN
CPL COOPER
BLACK
POTTAGE Colin
GONCALVES Collins
Dr. COOPER David
MC WYATT
SMITH Ian
SHACKELL John

GERMANY
POMPER Stephan
MULLER Klaus
BRESLER Chnstian
BAUER Ewald

ITALY

DOMINGUEZ Olivan
FERNANDEZ LOPEZ Alfredo

CANADA
HANCOCK James
OSTNER Konrad
NADEAU Jean Guy
TREMBLAY Roger

USA
ORR Sheldon
PENHOLLON
HARWOOD
HAMILTON Darcus
SMITH Walter
MERCER SCOTT Douglas

MASSARO Antonello
PASQUALI Vinicie
PINCIARELLI Luca
LA MANNA Edmondo

DENMARK
KOZIOL Jan
HANSEN

NATO
SCOTT Anthony
WILS Eric
Gal VALIANCE
Capt. REILLY
SEMANCIK Karl

ANNEX III

PROTECTION/CONTAMINATION CONTROL CHECKLIST FOR A UNIT MILITARY TEAM

Reference: STANAG 2150, STANAG 2352, and STANAG 2429

ITEM	CHARACTERISTICS	OP*	COMMENTS
1	**Protection**		
1.1	Is each member of the Sampling Team Equipped with Mask, Canister, and IPE to include gloves and boots IAW STANAG 2352		
1.2	Is each member of the Sampling Team individually identified IAW STANAG 2429		
1.3	Is each member of the Sampling Team equipped with individual decontamination kits and individual medical countermeasures IAW STANAG 2352		
1.4	Does each member of the Sampling Team have his individual protective equipment properly donned and fitted IAW STANAG 2150		
2	**Contamination Control**		
2.1	Are collected samples placed just near the contaminated side of the hot line.		
2.2	Do sampling team members properly decontaminate using available equipment (Hands and Feet) IAW STANAG 2150		
2.3	If a positive detection of contamination on the samples by the French Contamination Control Team is experienced does the SICA team correctly decontaminate the samples.		
2.4	If a positive detection of contamination on the sampling team members IPE by		

the French Contamination Control Team is experienced does the SICA team correctly perform undressing procedures IAW STANAG 2150.

Additional comments:

OP: operational/in compliance +: fulfillment
*: fulfillment with comments -: no fulfillment

SAMPLING CHECKLIST FOR A UNIT MILITARY TEAM
Reference: AEP-10 Handbook, Edition 4, Chapter 2

ITEM	CHARACTERISTICS	OP*	COMMENTS
1.1	Is the minimum size of the unit military team two persons		
1.2	Is adequate detection equipment available and if yes is it based on a physical principle (e.g. IMS) or on wet chemistry		
1.3	Is equipment available for the recording of factual information (photocamera's etc.)		
2	**Sampling equipment**		
2.1	Is the contents of the sampling kit adequate to take at least 10 samples of all necessary types (air, soil, water,materials)		
2.2	Are primary sample containers made of Teflon, glass or plasticiser-free plastic material		
2.3	Are primary sample containers provided with adequate closures		
2.4	Is a variety of sample taking devices (e.g. spatulas, scoops) present		
2.5	Are sample taking devices (e.g. spatulas) disposable and/or individually sealed		
2.6	Are markers and pens present and do they provide a clear and waterproof writing		
2.7	Are sample documentation forms present and do they contain sufficient items to register all details of the sampling process		
2.8	Are sample chain-of-custody forms		

present
2.9 Are sample labels and seals present
Are non-breakable secondary containers and charcoal present for packaging and transport of samples
2.11 Are decontamination means present for decontaminating the outside of sample containers, if necessary
2.12 Does the sampling equipment provide for preserve samples (e.g. cooling)

OP: operational/in compliance   +: fulfillment
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SAMPLING CHECKLIST FOR A UNIT MILITARY TEAM

Reference: AEP-10 Handbook, Edition 4, Chapter 2

ITEM	CHARACTERISTICS	OP*	COMMENTS
3	**Air samples**		
3.1	Are air samples taken after an indication of the detection equipment		
3.2	Are samples taken downwind of the source		
3.3	Are vapour samples collected on adsorption tubes (Tenax or Chromosorb 106)		
3.4	Are aerosol samples (smoke) collected on aerosol filters		
3.5	Is the amount of the samples taken relevant (ca. 1 litre)		
3.6	Are control samples taken		
3.7	Are the primary sample containers closed correctly		
3.8	Are documentation forms filled-in		
3.9	Are samples labelled and sealed		
3.10	Are samples packed correctly (no contamination on the outside, not packed		

together with a liquid etc.)
3.11 Are samples packed in such a way that they are ready for transport to a laboratory
3.12 Are under the given circumstances the samples stored in such a way that decomposition is avoided

4 Water samples

4.1 Is the number of the samples taken relevant to the contaminated area
4.2 Is the amount of the samples taken relevant (in the order of 50-100 ml)
4.3 Are samples taken with clean collection instruments (pipettes, vacutainer tubes etc.)
4.4 Are samples taken at the right depth (surface and 25 cm, if relevant)
4.5 Are samples stored in clean containers (bottles etc.)
4.6 Is the size of the container not to large in relation to the amount of the sample
4.7 Are samples taken using solid phase extraction (SPE) tubes and if yes is the water pressed through the tubes collected as well

OP: operational/in compliance +: fulfillment
*: fulfillment with comments -: no fulfillment

SAMPLING CHECKLIST FOR A UNIT MILITARY TEAM

Reference: AEP-10 Handbook, Edition 4, Chapter 2

ITEM	CHARACTERISTICS	OP*	COMMENTS
4.8	Are control samples taken		
4.9	Are the primary sample containers closed correctly		
4.10	Are documentation forms filled-in		

4.11 Are samples labelled and sealed
4.12 Are samples correctly packed (no contamination on the outside of the container, size by size etc.)
4.13 Are samples packed in such a way that they are ready for transport to a laboratory
4.14 Are under the given circumstances the samples stored in such a way that decomposition is avoided

5 Soil samples

5.1 Is the amount of the samples taken relevant (cat 200 ml)
5.2 Is the numbs of the samples taken relevant to the contaminated area
5.3 Are samples taken at the right location (e.g. depth of 2 cm)
5.4 Are samples taken with clean collection instruments (spatulas, scoops etc.)
5.5 Are samples stored in clean containers (vials bags etc.)
5.6 Are control samples taken
5.7 Are the primary sample containers closed correctly
5.8 Are documentation forms filled-in
5.9 Are samples labelled and sealed
5.10 Are samples correctly packed (no contamination on the outside of the container, size by size etc.)
5.1 1 Are samples packed so that they are ready for transport to a laboratory
5.12 Are under the given circumstances the samples stored in such a way that decomposition is avoided

OP: operational/in compliance +: fulfillment
*: fulfillment with comments -: no fulfillment

SAMPLING CHECKLIST FOR A UNIT MILITARY TEAM

Reference: AEP-10 Handbook, Edition 2

ITEM	CHARACTERISTICS	OP*	COMMENTS
6	**Material samples**		
6.1	Is the amount of the sample taken relevant		
6.2	Is the number of the samples taken relevant to the contaminated objects		
6.3	Are samples taken with clean collection instruments knifes scissors etc.)		
6.4	Are samples taken by swabbing and if yes is each time a clean swab used		
6.5	Are samples stored in clean containers (vials, bags etc.)		
6.6	Are control samples taken, if possible		
6.7	Are the primary sample containers closed correctly		
6.8	Are documentation forms filled-in		
6.9	Are samples labelled and sealed		
6.10	Are samples correctly packed (no contamination on the outside of the container, size by size etc.)		
6.11	Are samples packed so that they are ready for transport to a laboratory		
6.12	Are under the given circumstances the samples stored in such a way that decomposition is avoided		

Additional comments:

OP: operational/in compliance +: fulfillment
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REPORTING CHECKLIST UNIT MILITARY TEAM
Reference: AEP-10 Handbook, Edition 4, Chapter 6 and ATP-45(A)

ITEM	CHARACTERISTICS	OP*	COMMENTS
1	**General**		
1.1	Is the Sampling Team aware of the appropriate communications chain of command		
1.2	Is the Sampling Team Aware of appropriate ATP-45(A) procedures		
1.3	Is appropriate communications equipment available		
1.4	Are appropriate message formats for reporting available		
2	**Reporting**		
2.1	Are correctly formatted NBC4 reports prepared for each sample taken		
2.2	Is SICA identified in Line QUEBEC of the NBC-4 report		
2.3	Is other pertinent sampling information entered in Line ZULU BRAVO of the NBC-4 Report		
2.4	Are the NBC-4 reports dispatched in a timely manner		

Additional comments:

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A Description of Canadian Preparation, Participation and Recommendations

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Between 9-11 September 1997, NATO conducted two field trials on the sampling and identification of chemical warfare agents. These field trials were hosted by the Centre d'Etudes du Bouchet at Vert le Petit, France. The primary objective of these trials was to assess the validity of the procedures and guidance provided in NATO Allied Engineering Publication 10 (AEP-10) in light of the practical experience gained during these field trials. Ten nations participated in the field trials (CA, DA, FR, GE, IT, NL, NO, SP, UK and US). The performance of each sampling team was assessed by umpires using criteria developed from the relevant NATO NBC standardization agreements. The NATO report published following the field trials concluded that: a) all participating nations have fully competent and effective sampling capabilities; and b) the field trials had generally validated the guidance provided in AEP-10.

This report described Canada's preparation for, participation in and recommendations from the NATO SICA field trials. Canada believes that these field trials were extremely useful not only from a scientific view, but also for raising the profile of SICA within the military. On the military side, it helped to focus our thoughts on how SICA teams might be deployed within the Canadian Forces. While the field trials helped validate the procedures in AEP-10, at the same time some problems were noted with respect to: a) the mandate of SICA; and b) the use of AEP-10 Handbook as an operational document.

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Chemical Warfare Agents

CW

Sampling

Identification

SICA

NATO

SIBCA